Course Title: **Radiological Control Technician**
Module Title: **Radiological Work Coverage**
Module Number: **2.11**

Objectives:

2.11.01 List four purposes of job coverage.

2.11.02 Explain the differences between continuous and intermittent job coverage.

2.11.03 Given example conditions, identify those that should require job coverage.

2.11.04 Identify items that should be considered in planning job coverage.

2.11.05 Identify examples of information that should be discussed with workers during pre-job briefings.

2.11.06 Describe exposure control techniques that can be used to control worker and technician radiation exposures.

☞ 2.11.07 Describe the in-progress radiological surveys that should be performed, at your site, under various radiological conditions.

☞ 2.11.08 Describe site requirements for documentation of in-progress radiological surveys.

☞ 2.11.09 Explain actions that should be taken if surveys show radiological conditions significantly different from that expected.

2.11.10 Describe contamination control techniques that can be used to limit or prevent personnel and area contamination and/or reduce radioactive waste generation.

2.11.11 Describe job coverage techniques that can be used to prevent or limit the spread of airborne radioactive material.

2.11.12 Describe overall job control techniques in maintaining control of radiological work.

2.11.13 State the reasons to stop radiological work activities in accordance with the DOE RCS.

References:

1. "DOE Radiological Control Standard," DOE-STD-1098-99.

Instructional Aids:

1. Overheads
2. Overhead projector/screen
3. Whiteboard/chalkboard
4. Lessons learned

I. LESSON INTRODUCTION

A. Self Introduction

1. Name
2. Phone number
3. Background
4. Emergency procedure review

B. Motivation

The purpose of job coverage by RCTs is to assist workers in keeping their radiation exposures ALARA.

C. Lesson Overview

1. Explanation of job coverage
2. Conditions requiring job coverage
3. Prerequisites for planning job coverage
4. Job coverage techniques

D. Introduce Objectives — O.H.: Objectives

II. LESSON OUTLINE

A. Explanation of Term "Job or Work Coverage" — Ask students what is meant by job or work coverage. Modify their answers for correctness.

1. Purposes — Objective 2.11.01 Ask students for the purposes of job coverage. Modify their answers for coverage and list on blackboard.

a. Radiation exposure control

1) Keep ALARA

2) Keep within limits

b. Contamination control

1) Reduce creation

2) Reduce spread

c. Airborne radioactive material control

1) Reduce creation

2) Reduce spread

d. Radioactive waste

Reduce creation

2. Types

Objective 2.11.02

a. Continuous

Technician remains at the job site during entire job and covers only that job

b. Intermittent

Coverage of more than one job or periodic checks for job coverage

B. Conditions Requiring Job Coverage

Objective 2.11.03
Ask the students for conditions that could require job coverage. Modify their answers and write on the board. After you write on the board, give an example of each condition.

1. Workers doses near limits
2. Radiation levels increase significantly
3. Entry to some high radiation levels
4. Spreading contamination or airborne
5. Contamination or airborne levels increase significantly
6. Questions regarding the adequacy of personnel dosimetry being used
7. Inexperienced workers

C. Prerequisites for Planning Job Coverage

Objective 2.11.04
Ask student what items should be planned before going on to the job site. Modify their answers for correctness. Write their answers on the board. Explain why each item must be considered.(See appropriate site document)

1. Detailed job description
2. Review past problem areas
   a. Review surveys
   b. Talk with technicians
   c. Review applicable Post Job ALARA Reviews
3. Review system
   a. Effects of opening
   b. Effects of welding, cutting, grinding
4. Detailed survey

a. Job site

High and low dose rate areas

Explain that by knowing the dose rate, individuals can avoid areas of highest dose rate and wait in low dose rate areas.

- Extremity dose rates
- Beta dose rates
- Hot Spots
- Other possible hazards

b. Pathways to site

c. Identify

1) Contamination levels

2) Airborne levels

5. Record workers' allowable exposures

Explain that these limits should be written down and taken to the job site. Do not trust memory.

6. Communications with workers

Ask students how communications can be achieved. Write their answers on the board.

a. Face-to-face

b. Hand signals

c. Remote headsets

d. Safety lines

e. Portable radios

7. Communications with lab

a. Transferring air samples

b. Results of surveys, samples

8. Equipment at job site

Ask the students what equipment should be available at the job site. List the equipment on the board. Explain why each could be needed.

a. Dosimeters

b. Charger

c. Air sampler

d. Survey instrument(s)

e. Respirator (if needed)

f. Watch or clock

g. Emergency Actions and Emergency Exits

9. Pre-job Briefings

Objective 2.11.05
Explain that by keeping the workers on the job informed, communications will be improved. Ask the students what information should be given to the workers. Write the information on the board.

a. Radiological conditions

b. Effect of job on conditions

c. Communications method

d. Special dosimetry

e. Special protective clothing

f. RCT functions

g. Importance of following the RWP and its specific directions

D. Job Coverage Techniques

Objective 2.11.06
Explain that the exact techniques used will vary depending on the job, radiological conditions, and worker experience. For each of the following techniques, state the technique and why it is necessary. Teach as a discussion.

1. Exposure Control

Write "Exposure Control" on the board. List the techniques under this heading. Leave these techniques under this heading. Leave these techniques on the board. Use the same method for Sections 2-4, so that at the end of the lecture all four headings and the respective techniques will be on the board.

a. Perform frequent surveys during job performance

1) Purpose and types of surveys

2) Base on probability of conditions changing

3) Required by operational procedures

4) Document Surveys

a) Purpose	
b) Requirement	
5) Report unusual conditions to management	For examples of when surveys are required during job performances, refer to site procedures.
6) Verify dose rates remain as posted	
b. Wait in low dose rate areas	Ask students how this can reduce dose received. Modify answers for correctness.
1) Purpose	
2) Identify from survey	
3) Reduces time in radiation area	
c. Check dosimeters	
1) Purpose	
Accumulated dose	
2) Technician reads	
3) Have workers read	
4) Reduce contamination of dosimeter	
a) Remove outer glove	
b) Use clean glove	
d. Determine time allowed in areas	Explain that not all of the time can be allowed for performing the job. Workers may receive

significant exposure going to and leaving the job.

Time = Authorized Exposure/Dose Rate

e. Workers location vs. dose rate

1) Purpose

Determine dose received

2) Dose = Dose Rate x Time

f. Document workers' locations and times

Purpose
- Prevent reliance on memory
- Inaccurate dose estimates

g. Workers dosimetry location vs. dose rate

Ask the students why this is an important concept. Use a drawing to illustrate an example if necessary.

1) Purpose

Dose estimation

2) May require special dosimetry

a) Finger badges

b) Extremity

c) Head

h. Modify temporary shielding

1) Purpose

Prevent un-evaluated exposure rates

2) Must have Rad Con approval

i. Modify temporary shielding - Rad Con Must evaluate before moving	
j. In-progress radiological surveys *(Insert site specific information here)*	Objective 2.11.07
k. In-progress radiological survey documentation *(Insert site specific information here)*	Objective 2.11.08
l. Unexpected radiological conditions *(Insert site specific information here)*	Objective 2.11.09
2. Contamination Control	Objective 2.11.10 Write "Contamination Control" beside "Exposure Control." List each technique beneath Contamination Control.
a. Watch workers	Ask the Students what actions they should be looking for.
1) Purpose Lessen personnel and area contamination	
2) Look for	
a) Hand to face movements	
b) Dropping tools	
c) Hammering	
d) Scuffing feet	
e) Wire brushing	
b. Transferring material	

1) Bagging

Thoroughly cover all of the correct practices in bagging tools, trash or equipment.

2) Plastic sheets

3) Floor cover for pathway

c. Tools and equipment

Ask students what steps can be taken to lessen the probability of contaminating tools and equipment before use.

Methods

- Taping
- Using previously contaminated tools

d. Equipment going from contaminated to clean areas

Ask the student for examples of equipment that may go from contaminated to clean areas.

Examples

- Crane rigging
- Air and water hoses (secure hoses/lines)

e. Reduce radioactive waste

1) Purpose

a) Reduce contamination

b) Reduce costs

c) Reduce processing time

d) Reduce dose

2) Techniques

a) Remove packing material

b) Minimize water for decon

3. Airborne Radioactivity Control

Write "Airborne Radioactivity Control" on the board. List the techniques beneath this heading.

a. Actions creating airborne

Objective 2.11.11
Ask the students what actions could create airborne. modify their answers for correctness.

1) Actions causing

a) Opening systems

b) Welding, grinding, cutting

c) Hammering

d) Wire brushing

e) Sweeping

f) Leaks and sprays

g) Air hose systems/tools

2) Corrective actions

b. Portable air samples

1) Purpose

Identify problem

2) Analyze in lab	
Time delay	Ask students for a disadvantage of analyzing the sample in a lab.
3) Corrective measures	
c. Continuous air monitors (CAMs)	
1) Purpose	
Identify problem	Ask the students for an advantage of CAMs vs. portable air samples.
2) Immediate indication	
3) Corrective measures	Ask the students for the disadvantages of CAMs compared to portable samplers.
d. Ventilate enclosed areas	
1) Purpose	
a) Remove airborne	
b) Contain airborne	
2) Installed ventilation	
3) Temporary ask students for examples of temporary ventilation.	
a) Fans with hose and HEPA filters	
b) Hose from installed duct of HVAC	
c) Tents	
4. Overall Job Control Techniques	Objective 2.11.12

Write "Overall Job Control" on the board. List the techniques beneath this heading.

a. Establish worker trust and confidence

Ask students for characteristics of people they trust. Point out that they should develop the same characteristics to earn worker trust.

1) Purpose

Improve communications

2) Earned not given

3) Techniques

a) Reliable

b) Realistic

c) Credible

d) Consistent

b. Keep workers in sight

1) Purpose

a) Identify poor work habits

b) Correct poor work habits

2) Sometimes impossible

c. Keep contact with workers

Explain that most workers are apprehensive when using remote communications. Staying in contact alleviates their concerns.

1) Purpose

a) Improve rapport

b) Alleviate worker apprehension

2) Techniques

State that even though RWP's usually require workers to notify RC, the technician should remind the workers of the requirement and explain the reasons why to the workers.

a) Face to face

b) Remote communications

d. Workers' Notification to RC

1) Purpose

Prevent un-evaluated radiological conditions

2) Before opening systems

3) Before changing work techniques

e. Correct poor work habits

1) Purpose

a) Prevent contamination of workers and area

b) Keep doses ALARA

2) Techniques

a) Offer as advice

b) Explain consequences

c) Explain proper method

f. Show a positive, helpful attitude toward co-workers

Purpose

- Improve communications
- Improve credibility

g. Don't overreact

1) Consequence

2) Remain calm

h. Stop Work Authority — Objective 2.11.13

1) Purpose

2) Maintain Control

3) Reevaluate situation

4) Correct problem before allowing work to continue — Teach as a discussion. Present the students with the problem area and ask for the consequences of the problem and how the problem could be solved. Note that more than one answer could be correct. Encourage student participation by asking if there are more ideas or if they are all in agreement with the solution.

5) Stop work when:

a) Inadequate radiological controls

b) Radiological controls not being implemented

c) Radiological hold point not being satisfied

d) Any workers dosimeter alarms or exhibits unexpected readings

6) Example situation of when to use stop work authority

5. Common problem areas

a. Remaining in work area, not lower exposure area.

b. Leaning or sitting on high contact dose rate equipment.

c. Not using existing shielding to full advantage.

d. Improperly handing item out of controlled area.

e. Not catching radioactive liquids (if applicable).

f. Creating unnecessary radwaste.

g. Improperly ventilating areas.

h. Removing high dose rate items from work areas.

i. Moving crane rigging in and out of contaminated areas.

j. Improperly controlling hot sparks and burning slag when welding.

k. Remaining in high dose rate areas beyond time allowed.

l. Opening systems or containers before notifying RC.

m. Changing work methods before notifying RC.

III. SUMMARY

A. Review major points

1. Explanation of job coverage

2. Conditions requiring job coverage

3. Prerequisites for planning job coverage

4. Job coverage techniques

B. Review learning objectives

IV. EVALUATION

Evaluation should consist of a written examination comprised of multiple choice, fill-in the blank, matching and/or short answer questions. 80% should be the minimum passing criteria for examinations.

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